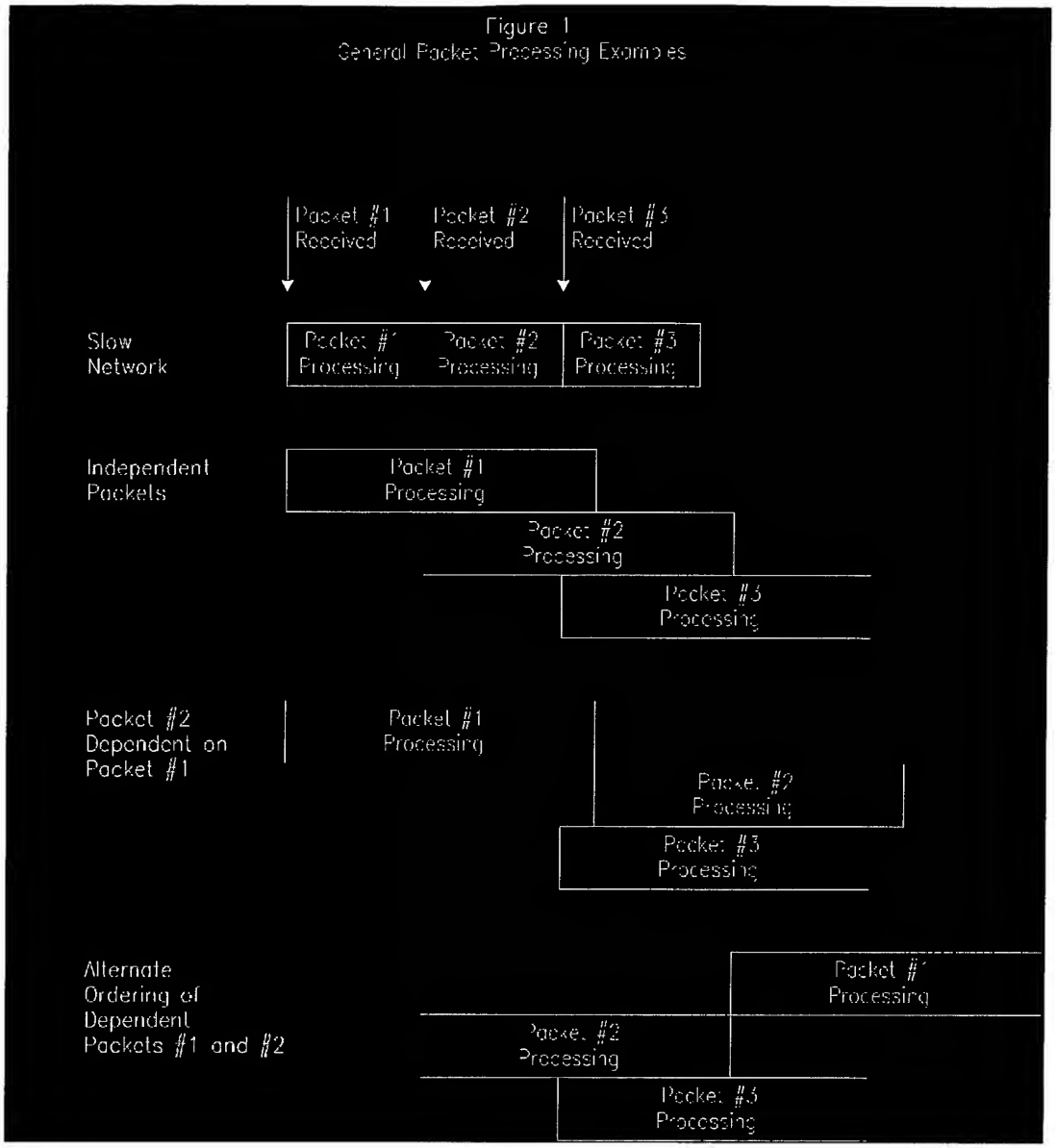


Figure 1
General Packet Processing Examples
Packet #1 Received
Packet #2 Received
Packet #3 Received
Slow Network
Packet #1 Processing
Packet #2 Processing
Packet #3 Processing
Independent Packets
Packet #1 Processing
Packet #2 Processing
Packet #3 Processing
Packet #2 Dependent on Packet #1
Packet #1 Processing
Packet #2 Processing
Packet #3 Processing
Alternate Ordering of Dependent Packets #1 and #2
Packet #1 Processing
Packet #2 Processing
Packet #3 Processing

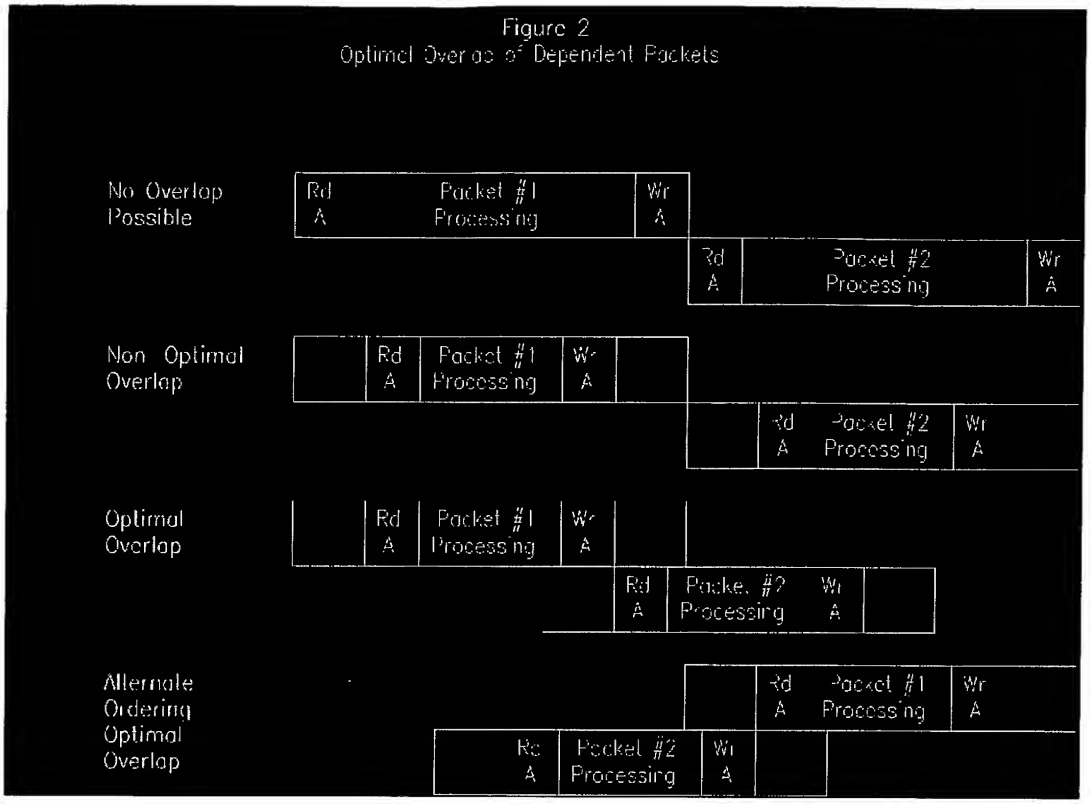


Figure 2
Optimal Overlap of Dependent Packets

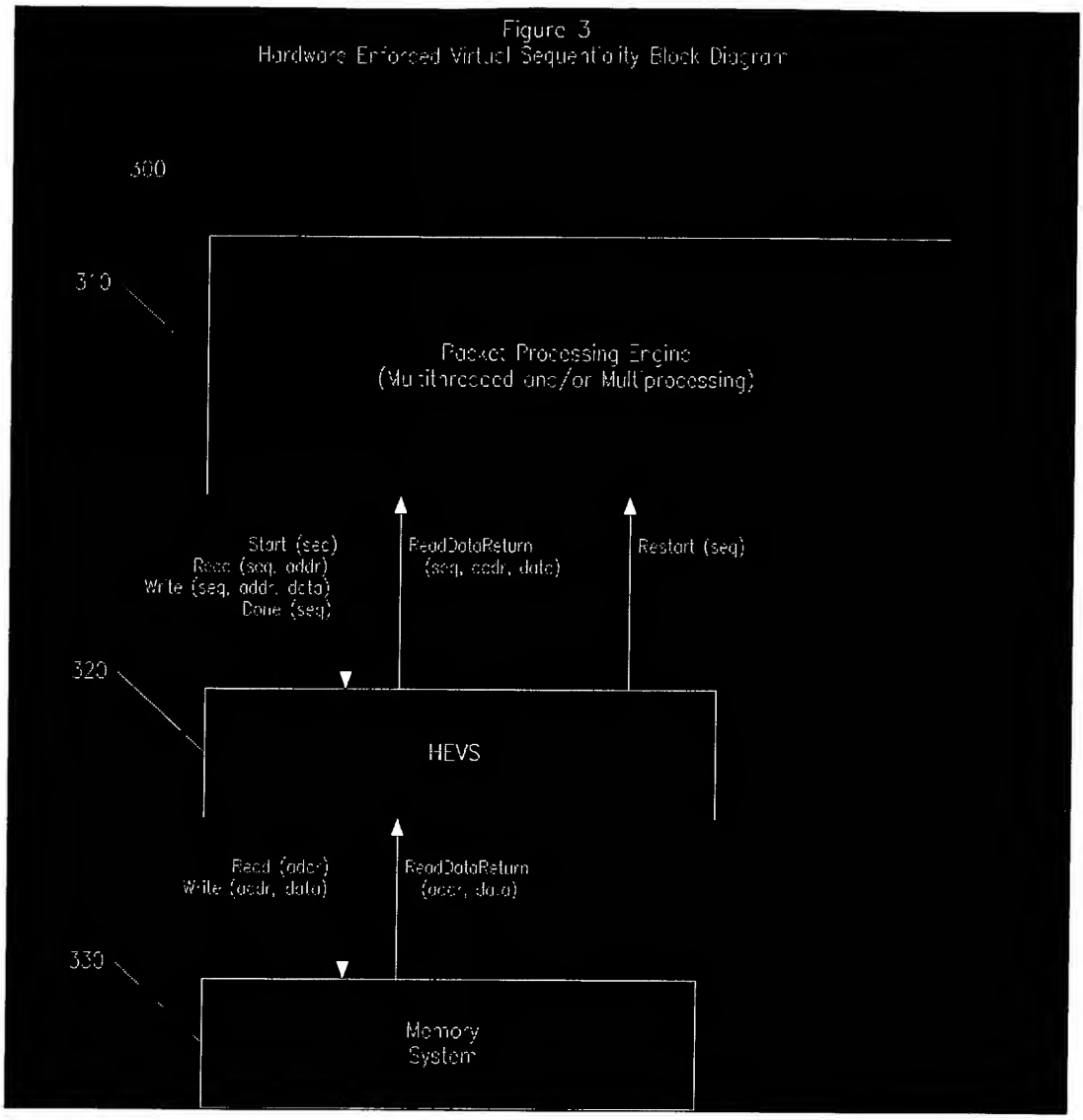


Figure 3
Hardware Enforced Virtual Sequentiality Block Diagram
300
310
Packet Processing Engine
(Multithreaded and/or Multiprocessing)
Start (seq)
Read (seq, addr)
Write (seq, addr, data)
Done (seq)
ReadDataReturn
(seq, addr, data)
Restart (seq)
320
HEVS
Read (addr)
Write (addr, data)
ReadDataReturn
(addr, data)
330
Memory
System

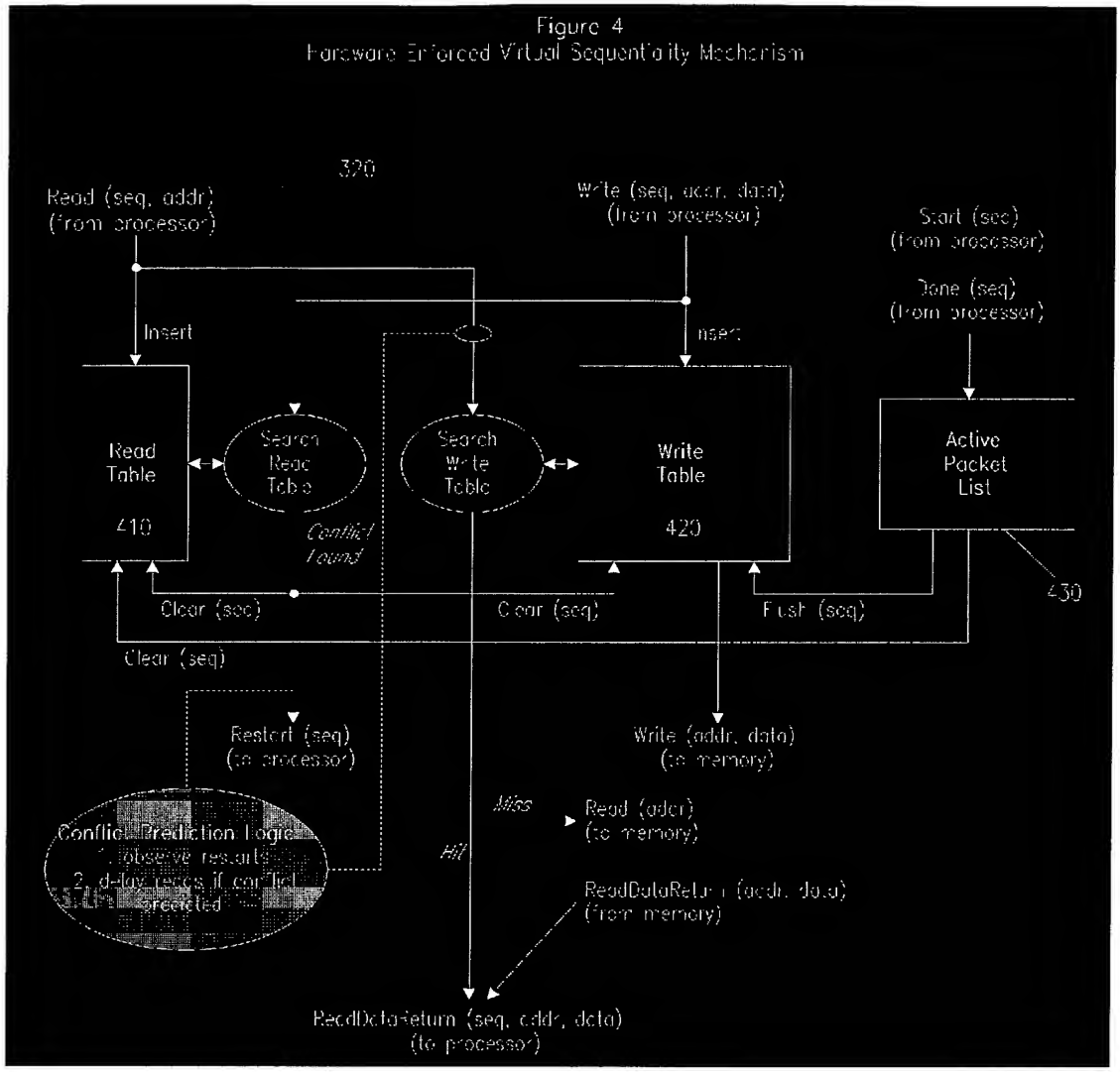
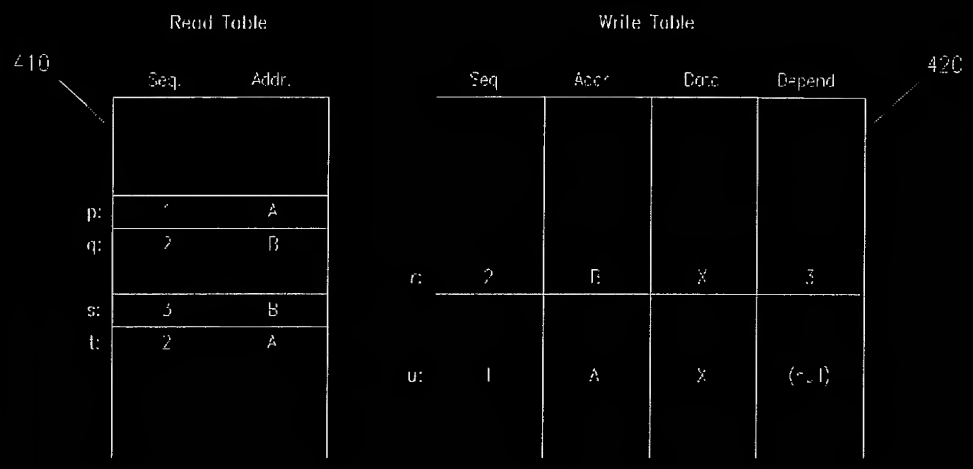


Figure 4
Hardware Enforced Virtual Sequentiality Mechanism
320
Read (seq, addr)
(from processor)
Write (seq, addr, data)
(from processor)
Start (seq)
(from processor)
Done (seq)
(from processor)
Insert
Insert
Read Table
410
Search Read Table
Search Write Table
Conflict Found
Write Table
420
Active Packet List
430
Clear (seq)
Clear (seq)
Flush (seq)
Clear (seq)
Restart (seq)
(to processor)
Write (addr, data)
(to memory)
Miss
Read (addr)
(to memory)
Conflict Prediction Logic
Observe results
Hit
ReadDataReturn (addr, data)
(from memory)
ReadDataReturn (seq, addr, data)
(to processor)

Figure 5
Read Table and Write Table Detail



Time Sequence:

1. Packet #1 reads location A
   Entry p: created in Read Table
   Write table is searched, no matches found so memory read is performed

2. Packet #2 reads location B
   Entry q: created in Read Table
   Write Table is searched, no matches found so memory read is performed

3. Packet #2 writes location B
   Entry r: created in Write Table
   Read Table is searched, no conflicts found

4. Packet #3 reads location B
   Entry s: created in Read Table
   Write Table is searched, entry r: found, data X forwarded and dependency list created

5. Packet #2 reads location A
   Entry t: created in Read Table
   Write table is searched, no matches found so memory read is performed

6. Packet #1 writes location A
   Entry u: created in Write Table
   Read Table is searched for newer sequence read, entry t: is found
      Conflict is signaled to processor, Packet #2 is restarted
      Entry q: and all other sequence 2 entries are deleted
      Deletion of entry r: triggers Packet #3 restart signaled

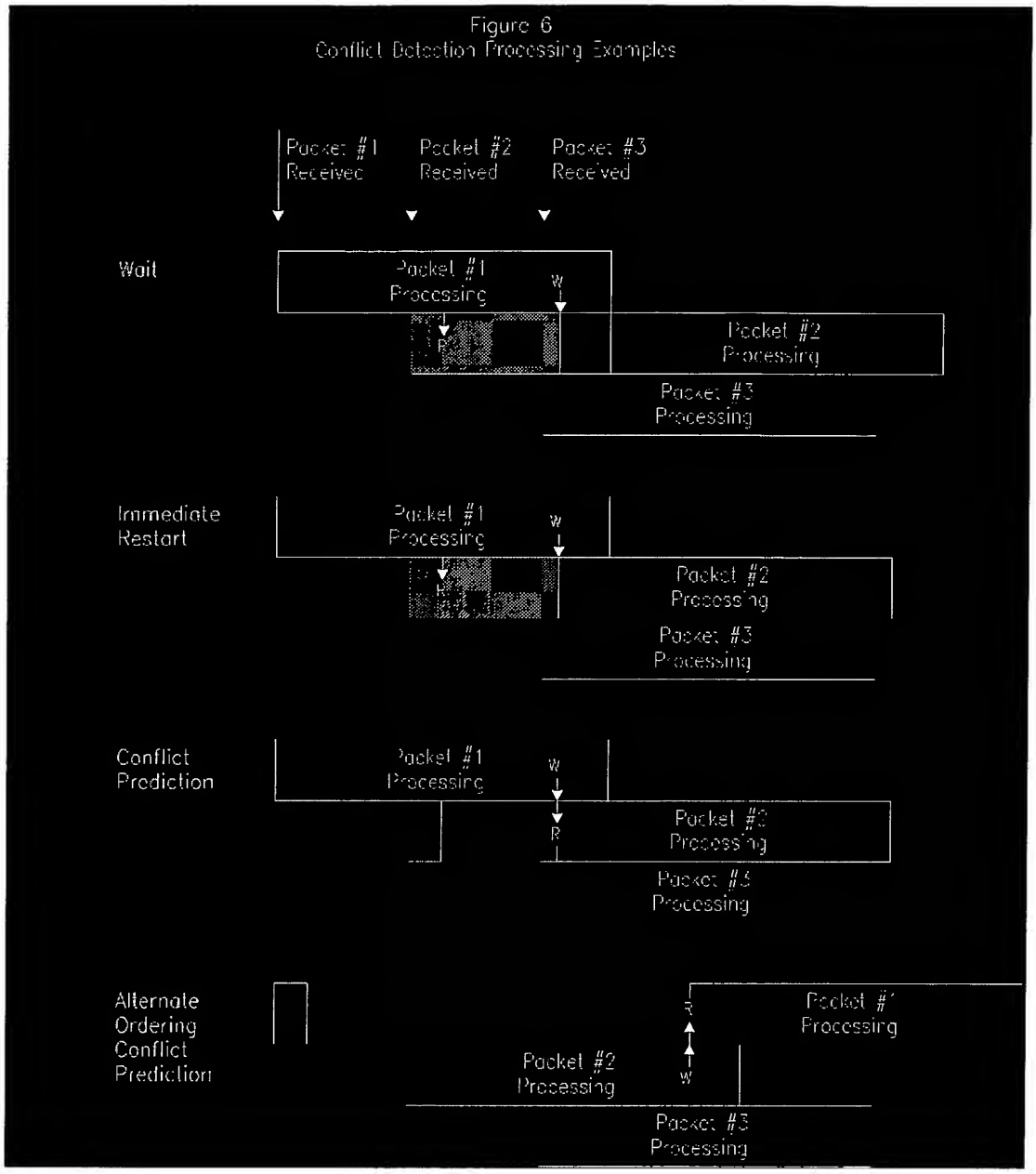


Figure 6
Conflict Detection Processing Examples
Packet #1 Received
Packet #2 Received
Packet #3 Received
Wait
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Immediate Restart
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Conflict Prediction
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Alternate Ordering Conflict Prediction
R
Packet #' Processing
Packet #2 Processing
W
Packet #3 Processing